

REMARKS

I. Specification

The Examiner objected to the disclosure because of the following informalities: on page 11, line 7, the Examiner suggested to change 14 to 15; and on page 15, line 8 the Examiner suggested to change reference numeral 40 to 70. The Examiner indicated that appropriate correction is required. The Applicants have therefore amended the specification as indicated here to correct these informalities.

II. Drawings

The Examiner objected to the drawings as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: in FIG. 1, reference numeral 12. The Examiner indicated that a proposed drawing correction, corrected drawings, or amendments to the specification to add the reference sign(s) in the description, are required in reply to the Office Action to avoid abandonment of the application.

The Applicants have therefore amended paragraph 0028 of Applicants' specification to refer to reference numeral 12 as the backside of wafer 24. Applicants submit that such an amendment to the specification overcomes the Examiner's objection to the drawings. Applicants further believe that such an amendment is merely clarifying in nature and does not constitute new matter. Therefore, the Applicants request that the aforementioned objection to the drawings be withdrawn.

III. Claim Rejections Under 35 U.S.C. § 103

Requirements for Prima Facie Obviousness

Applicants note that the obligation of the Examiner to go forward and produce reasoning and evidence in support of obviousness is clearly defined at M.P.E.P. §2142:

The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness.

M.P.E.P. §2143 sets out the three basic criteria that a patent examiner must satisfy to establish a *prima facie* case of obviousness:

1. some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings;
2. a reasonable expectation of success; and
3. the teaching or suggestion of all the claim limitations by the prior art reference (or references when combined).

It follows that in the absence of such a *prima facie* showing of obviousness by the examiner (assuming there are no objections or other grounds for rejection), an applicant is entitled to grant of a patent. *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443 (Fed. Cir. 1992).

Thus, in order to support an obviousness rejection, the Examiner is obliged to produce evidence compelling a conclusion that each of the three aforementioned basic criteria has been met.

Mizuno in view of Yadav and Marumo

The Examiner rejected claims 1-3, 6, 7, 9, and 10 under 35 U.S.C. § 103 as being unpatentable over Mizuno et al, "Mizuno" (U.S. Patent No. 6,129,046) in view of Yadav et al., "Yadav" (U.S. Patent Application Publication No. 2003/0026904A1) and Marumo (JP 4-219953-A).

The Examiner argued Mizuno teaches an apparatus (citing FIG. 4 of Mizuno) and a method of plasma processing such as plasma etching of a wafer 114 placed on a support member 115 wherein the substrate 114 is clamped onto the support member 115 by a differential pressure chuck, wherein the pressure difference is produced by exhausting air in an annular groove 126 and radial grooves 127 using a differential pressure chuck exhaust mechanism 124 (citing column 1, line 43 through column 2 lines 16 of Mizuno). Applicants note that the differential pressure chuck is not utilized nor could it be adapted for use in measuring the pressure at the front and back sides of the wafer, and therefore a differential pressure gradient thereof.

The Examiner admitted that Mizuno fails to teach determining a differential pressure gradient between the front and back side of the substrate. The Examiner argued, however, that Yadav teaches a semiconductor processing apparatus (citing FIG. 2A of Yadav) including a differential pressure chuck 135 wherein the pressure at the front and back surface of the substrate placed on the upper surface of a support plate 20 is measured by pressure sensors 166 and 168 and communicated with a controller 170 so that the vacuum pressure at the back and front surface of the substrate can be controlled throttle valves 162 and 164 (citing paragraphs 0047-0051 of Yadav).

The Examiner therefore argued that it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the pressure control mechanism as taught by Yadav in the apparatus of Mizuno in order to control the pressure level on the back and front surface of the substrate.

The Applicants respectfully disagree with this assessment. Applicants believe that this argument fails under the first prong of the prima facie obviousness test discussed above because neither Yadav nor Mizuno and/or Marumo, teach, suggest or disclose, alone or in combination with one another, the ability to control the

pressure level on the back and front surface of the substrate for the purpose of determining and measuring a differential pressure gradient and ultimately detecting a wafer position shift on the lower electrode. Under the first prong of the prima facie obviousness test, some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings, must be identified and shown in the cited references. The Examiner has not identified a motivation or suggestion in the Yadav, Mizuno and/or Marumo references, which specifically suggest the ability to control the pressure level on the back and front surface of the substrate for the purpose of determining and measuring a differential pressure gradient and ultimately detecting a wafer position shift on the lower electrode.

The Applicants remind the Examiner that the language of the references may not taken out of context and combined without motivation, in effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the invention as claimed. The claims are rejected under 35 U.S.C. §103(a) and no showing has been made to provide the motivation as to why one of skill in the art would be motivated to make such a combination, and further fails to provide the teachings necessary to fill the gaps in these references in order to yield the invention as claimed.

The rejections under 35 U.S.C. §103(a) have provided no more motivation than to simply point out the individual words of the Applicant's claims among the references. Without a basis and reason for rejections to Applicant's claims and specification (e.g., without reason as to why and how the references could be combined to provide the Applicant's invention as claimed), the Examiner's analysis may be viewed as incorporating the benefit of hindsight. Hindsight cannot be a basis for providing motivation, and is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(a) rejection.

Applicants also submit that the argument presented above by the Examiner fails under both the second and third prongs of the prima facie obviousness test. The Examiner has not properly explained a reasonable expectation of success for combining the references as argument. The Examiner has also not properly explained how the prior art references cited provide the teaching or suggestion of all of the claim limitations of the rejected claims.

Applicants also note that neither Mizuno or Yadav teach the step of placing a wafer on an electrode. The use of a lower electrode is important because it can provide electrical contact the wafer itself and also provide a basis for determining the differential pressure gradient between said front side and said back side of said wafer (which is not taught by Mizuno), and measuring the position of said wafer on said lower electrode utilizing said differential pressure gradient.

Mizuno teaches only that the wafer 115 is placed on a support member 115, which is not an electrode as taught by Applicants' invention. Yadav teaches a support plate 120, but again, does not teach a lower electrode in a process chamber of a plasma etching device. Thus, because neither Yadav or Mizuno teach a lower electrode, it would be improper to combine Yadav with Mizuno as a basis for the teaching of the step of placing a wafer on a lower electrode in a process chamber of a plasma etching device, wherein said wafer comprises a front side and a back side, which is taught by Applicants' claim 1.

Applicants further note that Mizuno teaches a differential pressure chuck exhaust mechanism 124. Applicants do not require the use of such an exhaust mechanism. Exhausting air from the process chamber of Applicants' invention is not necessary for measuring the differential pressure at front and back sides of the wafer. As column 2, lines 124-126 explain, "...the air in the annular groove 126 and the radial grooves 127 is exhausted through an exhaust port 125 which is connected to a differential pressure chuck exhaust mechanism 124". Thus, the air

exhausted from the reactor 111 of Mizuno is exhausted through the exhaust port by the differential pressure chuck exhaust mechanism, which has nothing to do with determining and measuring the differential pressure sensor between the front side and back side of the wafer.

The differential pressure chuck exhaust mechanism 124 of Mizuno uses the term "differential pressure", but this is misleading because differential pressure chuck exhaust mechanism 124 does not contribute to or result in measuring the differential pressure at the top and bottom sides of the wafer on a lower electrode. In fact, utilization of the differential pressure chuck exhaust mechanism 124 of Mizuno would merely result in the release of air or gases within the process chamber. In plasma etching operations in particular, the use of a differential pressure chuck exhaust mechanism 124 would result not only in damage to the wafer and the plasma etching device but could result in the release of dangerous and toxic plasma gases, which might harm or injure the plasma etcher operator. Thus, one skilled in the art would not look to the differential pressure chuck exhaust mechanism 124 of Mizuno as a basis for deriving Applicants' methodology.

In fact, the differential pressure achieved by the FIG. 4 figure of Mizuno is achieved by the pressure difference produced between the internal pressure of the reactor 111 and the pressure on the back side of the substrate during film deposition rather than between the pressure between the front side and back side of the wafer (e.g., see lines 5-10, column 2 of Mizuno). Thee Mizuno, Yadav or Marumo references do not teach, suggest or disclose determining the pressure on both the front and back side of the wafer in order to determine a differential gradient thereof. Thus, it would be improper to combine such references alone or together to argue that it would have been obvious to determine the pressure on both the front and back sides of the wafer for the purpose of determining a differential gradient and ultimately the actual position of the wafer. In fact, none of

the aforementioned references actually result in measuring the position of the wafer.

It would also be improper to combine Mizuno with Yadav as a basis for setting forth a rejection to Applicants' claims under 35 U.S.C. 103(a) because Yadav does not teach plasma etching. Mizuno methods plasma processing, but the prior art drawing of FIG. 4 of Mizuno cited by the Examiner is not a plasma etching apparatus. Instead, FIG. 4 is a CVD (chemical vapor deposition) apparatus. Mizuno does not suggest or indicated that the apparatus of FIG. 4 is a plasma etching apparatus. Similarly, Yadav does not teach plasma processing. Instead, Yadav focuses on chemical vapor deposition (CVD) and physical vapor deposition (PVD) processes (e.g., see paragraph 0004, paragraphs 0043 and 0044 of Yadav). Yadav thus teaches away from plasma etching by teaching CVD and PVD etching, which is a much different type of etching process.

In fact, adapting CVD, PVD and other types of deposition processes to Mizuno could result in damage to the wafer and system components of Mizuno, because plasma etching involves a much different heating process, requiring different components and much more precise measurements. Thus, one skilled in the art would not have looked to Yadav at the time of Applicants' invention, but instead would have focused only on plasma etching references. Further one skilled in the art would not have looked to FIG. 4 of Mizuno as a plasma processing reference because FIG. 4 does not teach plasma processing, but instead focuses on CVD etching. Additionally, one skilled in the art would not have been inclined to look to Yadav simply because Yadav teaches away from plasma etching.

The Examiner admitted that Mizuno in view of Yadav fails to teach determining a differential pressure gradient in order to measure a position of the wafer on the substrate support. The Examiner argued, however, that Marumo teaches a substrate delivery and processing apparatus (citing FIG. 1) wherein the

pressure inside the chamber and the suction pressure of the substrate are detected respectively, and the state of the substrate is judged as being in a sucked state when the suction pressure of the substrate is less than a prescribed differential pressure according to the pressure inside the chamber (citing the abstract of Marumo).

The Examiner thus argued that it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Marumo in the method of using the apparatus of Mizuno in view of Yadav in order to judge the state of the position of the substrate on the differential pressure chuck. It is important to note, however, that Marumo does not result in a measurement of the position of the wafer. The Examiner has not noted any sections of Marumo, which indicate wafer position measurement techniques or devices. In fact, as indicated above, neither Marumo, Yadav, and/or Mizuno alone or together suggest, teach or disclose the measurement of the position of the wafer. Additionally, the Marumo, Yadav, and/or Mizuno references, alone or together suggest, do NOT teach or disclose the measurement of the position of the wafer based on a differential pressure gradient based on the back and front sides of the wafer.

Further regarding claim 1, the Examiner argued that the apparatus of Mizuno and Yadav each include a pump, exhaust mechanism 13 (citing Mizuno) and a vacuum pump 158 (citing Yadav). Applicants respectfully disagree with this assessment and submit that the arguments presented above by the Applicants render the Examiner's additional arguments regarding claim 1 moot. That is, it would not be proper to combine Mizuno, Yadav and/or Marumo as a basis for rejecting claim 1 under 35 U.S.C. 103 §(a).

Further regarding claim 3, the Examiner argued that the apparatus of Yadav include throttle valves 162. Applicants respectfully disagree with this assessment and submit that the arguments presented above by the Applicants render the

Examiner's additional arguments regarding claim 3 moot because claim 3 depends from claim 1. That is, it would not be proper to combine Mizuno, Yadav and/or Marumo as a basis for rejecting claim 1 (from which claim 3 depends) under 35 U.S.C. 103 §(a).

Further regarding claim 6, the Examiner argued that the apparatus of Yadav includes a pressure sensor 168 to measure the pressure inside the process chamber. Applicants respectfully disagree with this assessment and submit that the arguments presented above by the Applicants render the Examiner's additional arguments regarding claim 6 moot because claim 6 depends from claim 1. That is, it would not be proper to combine Mizuno, Yadav and/or Marumo as a basis for rejecting claim 1 (from which claim 6 depends) under 35 U.S.C. 103 §(a).

Further regarding claim 7, the Examiner argued that it is held (citing in re Harza) that a mere duplication of parts has no patentable significance unless a new and unexpected result is produced. The Examiner thus argued that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use more than one pressure sensor in order to further improve the accuracy of the pressure measurement. Applicants respectfully disagree with this assessment and submit that the arguments presented above by the Applicants render the Examiner's additional arguments regarding claim 7 moot because claim 73 depends from claim 1. That is, it would not be proper to combine Mizuno, Yadav and/or Marumo as a basis for rejecting claim 1 (from which claim 7 depends) under 35 U.S.C. 103 §(a).

Further regarding claim 9, the Examiner argued that Marumo teaches a substrate delivery and processing apparatus (citing FIG. 1 of Marumo) wherein the pressure inside the chamber and suction pressure of the substrate are detected respectively, and the substrate is judged to be in a sucked state when the suction pressure of the substrate is less than a prescribed differential pressure according to

the pressure inside the chamber. The Examiner argued that the selection of the predetermined differential pressure gradient is considered a result-effective variable parameter that would have been obtainable through routine experimentation and optimization process. The Examiner argued that it is not inventive to discover the optimum or workable ranges by routine experimentation (citing in re Allen). Applicants respectfully disagree with this assessment and submit that the arguments presented above by the Applicants render the Examiner's additional arguments regarding claim 9 moot because claim 9 depends from claim 1. That is, it would not be proper to combine Mizuno, Yadav and/or Marumo as a basis for rejecting claim 1 (from which claim 9 depends) under 35 U.S.C. 103 §(a).

Further regarding claim 10, the Examiner argued that the apparatus of Mizuno can be used in an etching method (citing column 1, lines 5-12 of Mizuno). Applicants respectfully disagree with this assessment and submit that the arguments presented above by the Applicants render the Examiner's additional arguments regarding claim 10 moot because claim 10 depends from claim 1. That is, it would not be proper to combine Mizuno, Yadav and/or Marumo as a basis for rejecting claim 1 (from which claim 10 depends) under 35 U.S.C. 103 §(a).

Mizuno in view of Yadav in view of Marumo and Sandhu

The Examiner rejected claims 4, 5, and 6 under 35 U.S.C. § 103(a) as being unpatentable over Mizuno in view of Yadav and Marumo as applied to claims 1-3, 6, 7, 9 and 10, and further in view of Sandhu et al., "Sandhu" (U.S. Patent No. 5,344,792).

The Examiner argued that Mizuno in view of Yadav and Marumo teaches all of the limitations of the claims as discussed, but admitted that Mizuno in view of Yadav and Marumo does not teach an additional valve connected in series with the throttle valve between the process chamber and the pump; and a pressure gauge between the process chamber and the pump.

The Examiner argued, however, that Sandhu teaches a process chamber (citing FIG. 1 of Sandhu) including an exhaust mechanism including a pressure sensor 26, valve 30, and throttle valve 32 arranged between a process chamber and a pump 36 (citing column 5, lines 16-31 of Sandhu). The Examiner argued that it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the pressure sensor and the additional valve as taught by Sandhu in the apparatus of Mizuno in view of Yadav and Marumo in order to be able to further control the rate of the vacuum of the process chamber.

The Applicants respectfully disagree with this assessment and note that all of the arguments presented above against the rejection to claims 1-3, 6, 7, 9, and 10 under 35 U.S.C. § 103 as being unpatentable over Mizuno in view of Yadav and Marumo apply equally to the rejection to claims 4, 5, and 6 under 35 U.S.C. § 103(a) as being unpatentable over Mizuno in view of Yadav and Marumo as applied to claims 1-3, 6, 7, 9 and 10, and further in view of Sandhu.

The Applicants note that the pressure sensor and additional valve of Applicants' invention is not used for the controlling the rate of the vacuum of the process chamber, as argued by the Examiner, but is instead utilized for supporting determining the pressure gradient between the front side and back side of the wafer and measuring the position of said wafer on said lower electrode utilizing said differential pressure gradient while said wafer is located on said lower electrode in order to detect said wafer shift on said lower electrode (i.e., see Applicants' amended claim 4).

Neither measuring the differential gradient or determining the differential gradient are disclosed, suggested or taught by Sandhu. Additionally, no suggest or motivation is provided by Sandhu indicating that a mere modification of the pressure sensor and additional valve as taught by Sandhu would result in a valve and/or pressure sensor for supporting determining the pressure gradient between

the front side and back side of the wafer and measuring the position of said wafer on said lower electrode, as indicated by Applicants' amended claim 4.

Neither Mizuno, Yadav, Marumo and/or Sandhu, alone or in combination with one another, teach such an electrode. Sandhu further does not teach, disclose or suggest a differential pressure gradient based on the front and back side of the wafer, determining such a differential pressure gradient and measuring such a differential pressure gradient, particularly for the purpose of detecting wafer shifts while the wafer is located in the process chamber. In order to combine Sandhu with Mizuno, Yadav, and/or Marumo, there must be some disclosure or suggestion in Sandhu indicating that a mere modification of Sandhu would lead to a teaching of all the features of Applicants' claims 4, 5, and 6, including all of the features of the claims from which claims 4, 5 and 6 depend. Thus, because such a teaching has not been found in Sandhu, it is improper to combine Sandhu with Mizuno, Yadav, and/or Marumo in the manner indicated by the Examiner.

The Applicants also note that Sandhu does not teach or suggest a wafer located on an electrode. Sandhu instead teaches a graphite or steel boat 20 upon which the wafer 18 is located.

Further regarding claim 8, the Examiner argued that the purge gas can be any of Ar, N₂ or He (citing Sandhu, FIG. 1, column 6, lines 39-50). The Applicants respectfully disagree with this assessment. Applicants' claim 8 is directed toward a the of claim 1 further comprising the steps of: delivering helium to said process chamber; and thereafter determining said differential pressure gradient between said front said and said back side of said wafer utilizing a plurality of associated pressure gauges.


In order to combine Sandhu with Mizuno, Yadav, and/or Marumo in the manner indicated by the Examiner for purposes of rejecting claim 8 under 35 U.S.C.

§ 103(a), there must be some teaching or suggestion in Sandhu of a "differential pressure gradient between the front and back side of the wafer" and determining and measuring such a differential pressure gradient for the purpose of detecting a wafer shift on the lower electrode. It is irrelevant that the purge gas can be any of Ar, N₂ or He (citing Sandhu, FIG. 1, column 6, lines 39-50) in light of the fact that Sandhu does not mention, suggest or teach such features and therefore, it is improper to combine Sandhu with Mizuno, Yadav, and/or Marumo in the manner indicated by the Examiner for purposes of rejecting claim 8 under 35 U.S.C. § 103(a). Thus, the Applicants submit that the aforementioned rejection to claim 8 has been traversed. Applicants respectfully request withdrawal of the aforementioned rejection to claim 8.

IV. Conclusion

In view of the foregoing discussion, Applicants have responded to each and every rejection of the Official Action, and respectfully request that a timely Notice of Allowance be issued. Applicants have clarified the structural distinctions of the present invention. Applicants respectfully submit that the foregoing discussion does not present new issues for consideration and that no new search is necessitated. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. 103 and further examination of the present application. Should there be any outstanding matters that need to be resolved in the present application; the Examiner is respectfully requested to contact the undersigned representative to conduct an interview in an effort to expedite prosecution in connection with the present application. The Commissioner is also hereby authorized to charge Deposit Account No. 50-0484 any fee due as a result of this amendment.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Randy Tung', is written over a horizontal line. The signature is enclosed within a hand-drawn oval.

Randy Tung (31,311)